Chapter 1: POINTS, LINES AND ANGLES

In the first chapter, different concepts relating to, Points Lines and Angles, will be explored using GSP. Each lesson will introduce and use different concepts essential for use and understanding in this software application and explore mathematical concepts pertaining to the intermediate curriculum.

Points, Line and Angles is divided into various lessons ensuring each expectation and geometric concept is properly met. By the end of this chapter students will gain a better understanding of the mathematical concepts of points, lines, segments, rays, complementary and supplementary angles, obtuse, acute and right angles as well as parallel and transversal lines.

The different GSP commands that will be introduced and put to use in this chapter include: dragging, and the measuring and labeling of points and lines. These commands are fundamental building blocks of GSP necessary for exploration into more complex functions.

LESSON ONE - Introduction of Points, Segments, Rays and Lines
- **ONTARIO CURRICULUM Covered:**
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  - Grade 7: 7m51, 7m52
  - Grade 8: 8m55, 8m58, 8m60, 8m68

This first lesson will perform diagnostic assessment to determine what level the students are fulfilling. In essence, this lesson will give students the knowledge of the different geometric terms or points, segments, rays and lines. It will also introduce various functions used in GSP.

This lesson will be best taught using a teacher-directed method. It will have the students participating in GSP throughout. Initially students will work together as a whole group on their own computer (or shared between two students, depending on the availability) to create different points, segments, rays and lines in GSP. They will therefore gain an understanding for the software application itself while learning more about geometry. Throughout the lesson, the educator will promote critical thinking by encouraging the students to explain how a particular function works and how the mathematical concepts correlate with GSP.

To assess this students knowledge, students will be required to independently construct a sketch by constructing points, segments, rays and lines. This activity will include both the mathematical information as well as an understanding of the GSP functions used.

LESSON TWO - Investigation of Acute, Obtuse and Right Angles
- **ONTARIO CURRICULUM Covered:**
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  - Grade 7: 7m47, 7m49, 7m51, 7m52, 7m57
  - Grade 8: 8m55, 8m57, 8m58, 8m60, 8m67

This next lesson will investigate the different types of angles: acute, obtuse and right angles. It will involve using straight and angle measurements with the GSP software application. Students will be able to investigate the properties of each angle by using previously used commands as well as integrating news ones.

It is recommended that the teacher start by guiding students to recall specific GSP functions and then to proceed to construct the lines necessary to make angles on their own. Problem solving will occur after certain functions have been performed and the students will be expected to answer specified questions independently. This inquiry will ensure that students properly understand the mathematical and GSP concepts that have been taught.

LESSON THREE - Investigation of Circles and Angles I
- **ONTARIO CURRICULUM Covered:**
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  - Grade 7: 7m52, 7m57

○ Grade 8: 8m55, 8m58, 8m69

The topic Investigation of Circles and Angles I will examine a special angle inscribed in a circle. It is beneficial for the teacher to guide the students through this introductory activity to circles as new material will be examined in GSP. The material will increase in difficulty in the next lesson, Investigation of Circles and Angles II.

Once teachers have assisted in the introductory activity, it is advised that teachers promote independent thinking by challenging the students to guide themselves through this lesson.

Students will learn how to measure angles within a circle by constructing their own using specific GSP commands. Measuring angles is a review for the students, the major difference with respects to the GSP program is the incorporation of a circle.

LESSON FOUR - Investigation of Circles and Angles II
- **ONTARIO CURRICULUM Covered:**
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    ○ Grade 7: 7m52, 7m57
    ○ Grade 8: 8m55, 8m58, 8m69

The lesson, Investigation of Circles and Angles II is a continuation of the previous lesson, Investigation of Circles and Angles I. The general concepts remain the same in both the curriculum and in GSP, but the level of difficulty increases.

Part first part of this lesson adopted a teacher-directed approach with the educator guiding the students through the mathematics and GSP. This lesson, however, will not only increase in difficulty but also in the amount of critical thinking on behalf of the students. Students will be responsible for independently recalling prior knowledge of GSP commands (NOTE: Teacher may offer assistance if absolutely necessary). At the end of this lesson, students will be able to construct a special angle inscribed in a circle and measure this angle all using GSP.

LESSON FIVE - Investigation of Angles and Intersecting Lines
- **ONTARIO CURRICULUM Covered:**
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    ○ Grade 7: 7m47, 7m49
    ○ Grade 8: 8m55, 8m57, 8m58, 8m69, 8m64

The lesson Investigation of Angles Formed by Intersecting Lines introduces the mathematical concept of supplementary angles (NOTE: This lesson is an introduction to supplementary angles, but this concept will be examined further in this chapter). Students will use GSP to investigate special pairs of angles created by two intersecting lines. Students will construct the specified figures independent of teacher aid.

This lesson is designed to begin with the instructor giving a brief synopsis of the activity. It will then transform to a more student-based learning experience with the students performing specified tasks in GSP on their own. Students will then proceed to use mathematical terminology to explain their conclusions to the class. This lesson leads into a lesson based upon Complementary angles. Complementary Angles: Two angles with the sum of 90 degrees.

LESSON SIX - Investigation of Complementary Angles
- **ONTARIO CURRICULUM Covered:**
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    ○ Grade 7: 7m47, 7m49, 7m52
    ○ Grade 8: 8m55, 8m57, 8m58, 8m60, 8m63, 8m64

Investigation of Complementary Angles allows students to familiarize themselves with complementary angles using GSP. This lesson follows the introductory lesson Investigation of Angles Formed by Intersecting Lines, which is based on the discovery of supplementary angles.

New functions as well as previously used commands will be explored in this lesson. It will be beneficial for the instructor to guide students through this lesson to ensure understanding of mathematical concepts as well as how to interpret the visual data represented in GSP.

NOTE: Teachers - Have students discover on their own, that complementary angles have the sum of 90 degrees.

LESSON SEVEN - Investigation of Supplementary Lines
- **ONTARIO CURRICULUM Covered:**
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  - Grade 7: 7m47, 7m49
  - Grade 8: 8m55, 8m57, 8m58, 8m60, 8m63

The lesson Investigation of Supplementary Angles will allow students to discover supplementary angles using GSP. This lesson will be entirely student-directed as the GSP commands that are implemented in this lesson have been used previously (thus, students should be familiar with these functions). It will be beneficial for the instructor to place the steps to the lesson on the black board and to generate a group discussion based on the activity.

Students will be able to independently sharpen their skills of constructing and labeling lines and rays in the GSP program. They will use critical thinking to describe their findings as well as the definition of supplementary angles.
Supplementary Angles: Two angles with the sum of 180 degrees.

LESSON EIGHT - Investigation of Angles Formed by Parallel Lines and a Transversal
- **ONTARIO CURRICULUM Covered:**
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  - Grade 7: 7m47, 7m49, 7m51, 7m52
  - Grade 8: 8m55, 8m57, 8m58, 8m60, 8m69, 8m64, 8m66, 8m71

This lesson is a useful summary of the GSP functions used thus far. It contains most of the various functions in GSP that were used. The students will be familiar with each function and the instructor will guide students through new ones.

This lesson involves problem solving for the students to discover different properties about the angles they create. The students will be creating two parallel lines as well as a transversal that will run through them. Along with performing specified tasks in GSP, students will be provided with a sheet of questions that will require them to use mathematical terminology to accurately describe their discoveries.

The recommended mode of instruction for this lesson is an initial teacher-direct approach followed by small-group or independent thinking led by the students themselves.